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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/553,764	06/26/2006	Rudolf Bahnen	LYBZ 2 00097	7729

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EXAMINER	
COMLEY, ALEXANDER BRYANT	
ART UNIT	PAPER NUMBER
3746	

MAIL DATE	DELIVERY MODE
11/13/2008	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/553,764	BAHNEN ET AL.	
	Examiner	Art Unit	
	ALEXANDER B. COMLEY	3746	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 June 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *23 April 2007* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *10/20/2005*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

3. **Claims 1-11** are rejected under 35 U.S.C. 103(a) as being unpatentable over United States Patent No. 4,417,857 to Sudbeck directed to a piston pump in view of United States Patent No. 4,492,529 to Grisbrook directed to Compressor Efficiency Improvement.

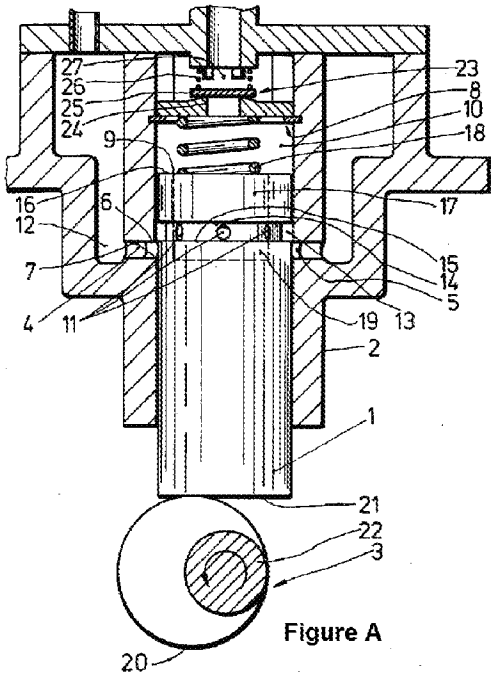


Figure A

In regards to Independent **Claims 1, 10, and 11**, and with particular to Figure A shown immediately above, Sudbeck discloses:

(1) A piston vacuum pump (Figure A), comprising a cylinder (2) and a piston (1) forming a compression chamber (10) with the cylinder (2) and oscillating in the cylinder (2) with a compression stroke and an intake stroke, a gas inlet (4) in a side wall of the cylinder (2), the gas inlet (4) being closed by the piston (1) at the beginning of the intake stroke, and an equalizing conduit (11, 13) with a valve (23), gas flowing from the gas inlet (4) through the equalizing conduit (11, 13) and the valve (23) into the compression chamber (10) during the beginning of the intake stroke, the piston (1) forming the equalizing conduit (11, 13) and the valve (23).

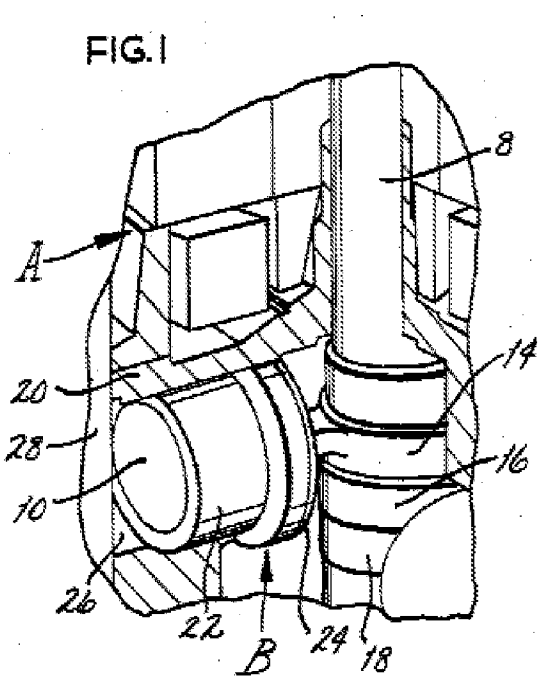
(10) A piston vacuum pump (Figure A) comprising: a cylinder (2) defined by a peripheral cylinder wall (2); a gas inlet aperture (4) defined in the cylinder side wall; a piston (1) mounted for reciprocating movement within the cylinder (2), the piston (1) including a peripheral side wall and walls that define a storage chamber (17) in the piston (1), the piston side wall having an aperture (11) that communicates with the gas inlet (4) at least at a beginning of an intake stroke, one of the piston end walls having an aperture (11) in communication between the storage chamber (17) and a compression chamber (10) defined by the piston (1) and the cylinder (2); and a one-way valve (23) mounted at the piston end wall aperture to permit gas flow from the storage chamber (17) to the compression chamber (10) and block the gas flow between the compression chamber (10) to the storage chamber (17).

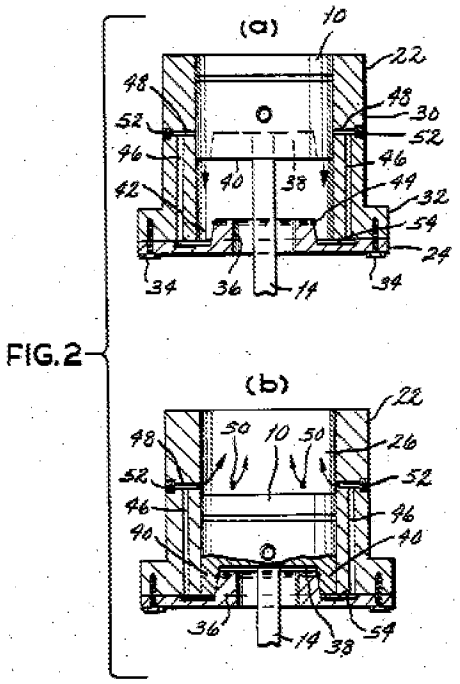
(11) A piston vacuum pump (Figure A) comprising: a cylinder (2) defined by a cylinder side wall; a gas inlet (4) defined in the cylinder side wall; a piston (1) mounted for reciprocating movement in the cylinder (2), the piston (1) having a side wall facing the cylinder side wall, the piston (1) and cylinder (2) defining a compression chamber (10); a gap (46, 48) between 10 and 100 um defined from the gas inlet (4) to the compression chamber (10) between the piston side wall and the cylinder side wall such that gas flows from the gas inlet (4) to the compression chamber (10) during at least a portion of an intake stroke and is

throttled from flowing from the compression chamber (10) to the gas inlet (4) during a compression stroke.

As shown in Figure A above, Sudbeck discloses a reciprocating piston pump for use in motor vehicles. In particular, Sudbeck describes the basic pump structure by stating "As shown in FIG. 1, the pump comprises a piston 1 which is moved up and down in a cylinder 2 by a drive 3. The cylinder 2 has a number of lateral inlet openings 4. These are in the form of bores or slits and are situated in the same cross-sectional plane of the cylinder, that is to say the upper and lower edges of the openings are all situated in the same planes across the cylinder. A circumferential internal groove 5 is associated with the inlet openings and this groove has in respect of the axial direction of the cylinder an upper control edge 6 and a lower control edge 7, by which the intake range of the liquid being pumped is sharply cut-off in each direction in respect of the piston movement." (Column 3, Lines 36-48) As can be seen in the figure, the internal groove 5 in the side of the piston corresponds with the inlets 4 in the sidewall of the cylinder. In particular, Sudbeck discloses " The pump operates in the following manner: with its parts in the positions shown in FIG. 1, the piston 1 is moving downwards; the outlet valve 23 is closed; the lower edge 15 of the external groove 13 of the piston 1 is situated exactly at the level of the upper control edge 6 of the internal groove 5 in the cylinder 2. During further downward travel of the piston, the liquid to be pumped can flow out of the suction chamber 12, through the inlet openings 4 in the cylinder 2 and the passages 11 in the piston 1, into the working chamber 10. The inflow of the liquid

occurs because a vacuum has developed in the working chamber 10 during the downward movement of the piston 1 that has already taken place, and the chamber contains vapour having a pressure equal to the partial pressure of the liquid being pumped." (Column 4, Lines 34-49) Sudbeck further discloses the use of a non-return valve with the piston in order to regulate the fluid pressure by stating "The cylinder head 8 is provided with a spring-loaded outlet valve 23, which consists of a valve seating 24, a valve closure plate 25 and a spring 26 bearing against the plate 25. This valve prevents, in the manner of a non-return valve, backward flow of delivered liquid out of a pressure chamber 27 situated downstream of the valve 23. It is, of course, also possible to position the outlet valve laterally in the cylinder 2 in the upper part of the working chamber 10." (Column 4, Lines 25-33). Finally, it can be seen in the figure that during the beginning of the intake stroke (as shown), the cylinder sidewall inlet 4 is blocked (i.e. closed) by the piston sidewall. However, the pump of Sudbeck fails to specifically disclose that the gas inlet is open at the end of the intake stroke (Claim 1), or that a gap is formed between a piston sidewall and a cylinder sidewall (Claim 11).





However, as can be seen in Figures 1-2 depicted immediately above, the Grisbrook portion of the combination specifically discloses that the gas inlets are opened at the end of the intake stroke (See Figure 2). In particular, Grisbrook states “A number of passages 46 and 48 are bored in sleeve 30, being of suitable dimension and extent for causing gas compressed by skirt 40 as it descends into recess 42 to be communicated to the space 26 above piston 10 when the piston has occupied or has nearly reached its lowermost position. Passages 48 open as indicated at 50 above piston 10 at a location just above the top of the piston when it occupies its lowermost position.” (Column 4, Lines 59-64) As shown in Figure 2b above, the piston passes below the gas inlets to it’s lowermost position (i.e. the end of the intake stroke), allowing gas to flow into the compression chamber. This is the same function as that claimed by Applicant. Furthermore, Grisbrook discloses the use of a gap disposed between the piston

sidewall and the cylinder sidewall, thereby forming an equalizing conduit. In particular, Grisbrook states " A number of passages 46 and 48 are bored in sleeve 30, being of suitable dimension and extent for causing gas compressed by skirt 40 as it descends into recess 42 to be communicated to the space 26 above piston 10 when the piston has occupied or has nearly reached its lowermost position. Passages 48 open as indicated at 50 above piston 10 at a location just above the top of the piston when it occupies its lowermost position." (Column 4, Lines 59-66) This gap 46 acts as an equalizing conduit for the compressed gas, and supplies it to the compression chamber in the same manner as Applicant's claimed gap structure. Moreover, Sudbeck in view of Grisbrook discloses the claimed invention except for the particular dimensions for the gap structure (Claim 11) It would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize such dimensions, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller, 105 USPQ 233.* Therefore, to one of ordinary skill desiring a more efficient vacuum pump, it would have been obvious to utilize the techniques disclosed in Sudbeck in combination with those seen in Grisbrook in order to obtain such a result. Consequently, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the pump structure of Sudbeck with the longer stroke length and/or gap structure of Grisbrook in order to obtain predictable results; those results being a more efficient vacuum pump by providing a precharge of gas to the compression chamber, thereby promoting a greater volume displacement during compression.

4. In regards to dependent **Claim 2 & 6**, the Sudbeck portion of the combination discloses that the openings (11) are formed directly in the piston sidewall, and moreover, that a recess (i.e. storage chamber) disposed within the piston head forms a connection between an opening in the piston end wall and the gas inlet. In regards to the recess and end wall opening, Sudbeck discloses "The openings 11 lead to a recess 17 in the piston head and hence to the pump chamber 10. The groove 13 moves into communication with the inlet openings 4 at two separate times in each to and fro movement of the piston, that is in each pumping cycle, so that the fluid being pumped can only flow into the pump chamber from the inlet openings 4 during these two times." (Abstract) Sudbeck goes on to state "The passages 11 in the piston 1 communicate with the working chamber 10 through a recess 17 provided in the end face 16 of the piston 1. This recess extends into the piston down at least as far as the plane of the lower edges of the passages 11." (Column 4, Lines 7-11) Also, during the beginning of the intake stroke, the piston passages (11) pass over the gas inlets (4), thereby providing connection to the piston end wall opening (17). Regarding dependent **Claims 3-4 & 9**, Sudbeck's outlet valve 23 is formed as a non-return valve arranged at the piston end wall and facing the compression chamber (See Column 4, Lines 25-33) In regards to dependent **Claim 5**, Sudbeck discloses an annular groove in the cylinder sidewall by stating "A circumferential internal groove 5 is associated with the inlet openings and this groove has in respect of the axial direction of the cylinder an upper control edge 6 and a lower control edge 7, by which the intake range of the liquid being pumped is sharply cut-off in each direction in respect of the piston movement." (Column

3, Lines 42-48) Similarly, regarding dependent **Claim 8**, Sudbeck discloses "A common circumferential external groove 13 is associated with the lateral passages 11 of the piston. The groove 13 has, in the axial direction of the piston, an upper edge 14 and a lower edge 15. This results in a sharp limitation in the side wall surface of the piston by which the range within which flow communication exists between the working chamber 10 and the suction chamber 12 as the piston moves upwards and downwards." (Column 3, Line 66 – Column 4, Line 6) Finally, in regards to dependent **Claim 7**, the Grisbrook portion of the combination discloses the use of a gap disposed between the piston sidewall and the cylinder sidewall, thereby forming an equalizing conduit. In particular, Grisbrook states " A number of passages 46 and 48 are bored in sleeve 30, being of suitable dimension and extent for causing gas compressed by skirt 40 as it descends into recess 42 to be communicated to the space 26 above piston 10 when the piston has occupied or has nearly reached its lowermost position. Passages 48 open as indicated at 50 above piston 10 at a location just above the top of the piston when it occupies its lowermost position." (Column 4, Lines 59-66) This gap 46 acts as an equalizing conduit for the compressed gas, and supplied it to the compression chamber in the same manner as Applicant's claimed gap structure. Moreover, Sudbeck in view of Grisbrook discloses the claimed invention except for the particular dimensions for the gap structure (Claim 11) It would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize such dimensions, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller, 105*

USPQ 233. Therefore, to one of ordinary skill desiring a more efficient vacuum pump, it would have been obvious to utilize the techniques disclosed in Sudbeck in combination with those seen in Grisbrook in order to obtain such a result. Consequently, it would have been obvious to one of ordinary skill in the art at the time of the invention to modify the piston pump of Sun beck with the gap structure of Grisbrook in order to obtain predictable results; those results being a piston pump that equalizes the gas pressure therein.

Conclusion

5. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. The following selected patents and technical literature is cited to further show the state of the art in piston vacuum pumps and related technology in general where the not all obvious salient features of the patents are disclosed as follows:

- US Patent No. 6,116,870 to Kraemer discloses a high pressure pump that utilizes a reciprocating piston with a circumferential groove disposed therein for communication with sidewall inlets

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ALEXANDER B. COMLEY whose telephone number is (571)270-3772. The examiner can normally be reached on M-F 7:30am - 5:00am EST (Alternate Fridays Off). If attempts to reach the examiner by telephone are

unsuccessful, the examiner's supervisor, Devon C. Kramer can be reached on (571)-272-7118. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Alexander B Comley/
Examiner, Art Unit 3746

/Devon C Kramer/
Supervisory Patent Examiner, Art Unit 3746

ABC